

PATENT ABSTRACTS OF JAPAN

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(54) WHITE CONDUCTIVE MATERIAL AND ITS PRODUCTION

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a white conductive material having a high conductivity by forming the conductive layer consisting of a first tin oxide layer of a stannic compd. and a second tin oxide layer of a stannous compd. and not contg. an antimony component on the surface of a substrate.

SOLUTION: A first tin oxide layer consisting of a stannic compd. (stannic chloride, etc.) is formed on the surface of a substrate, and further a second tin oxide layer consisting of a stannous compd. (stannous chloride, etc.) is formed on the first tin oxide layer to constitute a coating layer consisting of the two tin oxide layers. At this time, ≥ 3 pts.wt. of each of the first and second tin oxide layers is used with 100 pts.wt. of the substrate, the coating weight consisting of the two layers is preferably controlled to 5-100 pts.wt., expressed in terms of SnO₂ and based on 100 pts.wt. of the substrate, and the conductive layer is made substantially free of an antimony component. A white conductive material having a conductive layer consisting of tin oxide, free of antimony and high in whiteness is obtained in this way.

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CLAIMS

[Claim(s)]

[Claim 1] White conductivity matter which is white conductivity matter with the conductive layer which consists of tin oxide on the front face of a base material, and is characterized by consisting of the 1st tin oxide layer in which said conductive layer is formed from the second tin compound, and the 2nd tin oxide layer formed from a stannous compound, and the antimony component not containing substantially in said 1st tin oxide layer and said 2nd tin oxide layer.

[Claim 2] White conductivity matter according to claim 1 characterized by forming said 1st tin oxide layer on the front face of said base material, and forming said 2nd tin oxide layer on said 1st tin oxide layer.

[Claim 3] It is the approach of manufacturing the white conductivity matter which has the conductive layer which consists of tin oxide on the front face of a base material. Distribute said base material in water, consider as a water dispersion, and the second tin compound is added to this water dispersion. The water-insoluble nature matter of the second tin which deposits by making this react is made to deposit on said base material front face. Next, the manufacture approach of the white conductivity matter characterized by adding a stannous compound to this water dispersion, dehydrating after making the water-insoluble nature matter of the first tin which deposits by making this react deposit on the water-insoluble matter of said second tin, and heat-treating by the oxidizing atmosphere.

[Claim 4] The manufacture approach of the white conductivity matter according to claim 3 characterized by depositing each water-insoluble nature matter by adding an alkaline solution to coincidence and adjusting pH of said water dispersion to 2-5 in case said second tin compound and stannous compound are added to said water dispersion.

[Claim 5] The conductive constituent which consists of white conductivity matter manufactured by the white conductivity matter or an approach according to claim 3 or 4 according to claim 1 or 2, and binding material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the conductive constituent which contains this white conductivity matter in the high white conductivity matter and its manufacture approach list of a whiteness degree with the conductive layer which consists of tin oxide on the front face of a base material.

[0002]

[Description of the Prior Art] Development of a conductive ingredient is desired rather than before with remarkable development of the electronics industry. Although carbon black and the metal powder which are generally used as a conductive ingredient have very low electric resistance and being excelled in conductivity, since a color tone is a black network, the application is limited.

[0003] As white conductivity matter which can be colored, the conductive titanium oxide of what covered the front face of titanium oxide with tin oxide, and the white covered with the tin oxide which doped antimony is indicated (JP,53-92854,A, JP,58-209002,A, etc.).

[0004] Moreover, it is known that the direction which is the configuration which has the shape of a needle and which fibrous anisotropy can give desired conductivity by the fewer blending ratio of coal as a configuration of a conductive ingredient rather than spherical. Therefore, development research of the white conductivity ingredient in which conductive layers, such as tin oxide, were formed on the front face of base materials, such as fibrous, is performed briskly.

[0005] In JP,61-26933,B, the white conductivity matter which uses as a principal component the fibrous potassium titanate which covered the front face with tin oxide is indicated. Moreover, in JP,63-233016,A, the needlelike conductivity titanium oxide which covered tin oxide and antimony oxide on the front face of high definition needlelike titanium oxide is indicated. Moreover, in JP,6-183737,A, the conductive titanium oxide fiber which covered tin oxide and antimony oxide on the front face of monoclinic-system titanium oxide fiber is indicated.

[0006] By the way, since sufficient conductivity will not be acquired if a conductive layer is formed only by tin oxide, dope antimony, an oxygen defect is made to exist in a crystal lattice, and higher conductivity is made to discover in these conventional white conductivity matter. However, antimony has problems, such as toxicity, and to make conductivity discover by the tin oxide enveloping layer which does not contain antimony is desired.

[0007] In JP,6-207118,A, by making only a tin compound adhere to a base material, without using antimony, and performing the afterbaking processing by the non-oxidizing atmosphere or the reducing atmosphere, an oxygen defect is made in tin oxide and the method of making conductivity discover is indicated.

[0008]

[Problem(s) to be Solved by the Invention] However, when heat-treated in the non-oxidizing atmosphere or the reducing atmosphere, tin oxide colored it blue gray - black, and the white conductivity matter which has a high whiteness degree was not obtained, but such an inclination became more remarkable,

as it is going to acquire high conductivity.

[0009] Moreover, though natural, in order to heat-treat by a non-oxidizing atmosphere etc., the gas according to the facility and ambient atmosphere which were sealed, and its introductory facility were needed, and it became disadvantageous in manufacturing cost.

[0010] The purpose of this invention is to offer the conductive constituent with which antimony was not made to contain, but ** could also acquire high conductivity and the whiteness degree contained this white conductivity matter in the high white conductivity matter and its manufacture approach list.

[0011]

[Means for Solving the Problem] Invention according to claim 1 is the white conductivity matter with the conductive layer which consists of tin oxide on the front face of a base material, consists of the 1st tin oxide layer in which a conductive layer is formed from the second tin compound, and the 2nd tin oxide layer formed from a stannous compound, and is characterized by the antimony component not containing substantially in the 1st tin oxide layer and the 2nd tin oxide layer.

[0012] Here, it means that it is the content of extent by which the antimony component is not added ["the antimony component does not contain substantially" and] intentionally, and, specifically, means that it is 0.1 or less % of the weight of a content.

[0013] Invention according to claim 2 is characterized by forming the 1st tin oxide layer on the front face of a base material, and forming the 2nd tin oxide layer on the 1st tin oxide layer. Invention according to claim 3 is the approach that the white conductivity matter of invention according to claim 1 or 2 can be manufactured. Distribute a base material in water, consider as a water dispersion, and the second tin compound is added to this water dispersion. The water-insoluble nature matter of the second tin which deposits by making this react is made to deposit on said base material front face. Next, a stannous compound is added to this water dispersion, after making the water-insoluble nature matter of the first tin which deposits by making this react deposit on the water-insoluble nature matter of said second tin, it dehydrates, and it is characterized by heat-treating by the oxidizing atmosphere.

[0014] In invention according to claim 4, in the manufacture approach of invention according to claim 3, in case the second tin compound and a stannous compound are added to a water dispersion, it is characterized by depositing each water-insoluble nature matter by adding an alkaline solution to coincidence and adjusting pH of a water dispersion to 2-5.

[0015] In invention according to claim 4, each of addition of the second tin compound and addition of a stannous compound is performed in the acid field of pH 2-5. If the water-insoluble nature matter of these tin compounds is deposited in an alkaline field, since a deposit will take place rapidly, there is an inclination for adhesion to become an ununiformity. In order to make such a deposit loose, it is necessary to use the dropping liquid and the system of reaction which were diluted so much, and is not industrially desirable.

[0016] Invention according to claim 5 is a conductive constituent which consists of white conductivity matter manufactured by the white conductivity matter or the approach according to claim 3 or 4 of invention according to claim 1 or 2, and binding material.

[0017] Hereafter, the technical matter common to each invention according to claim 1 to 5 is explained as "this invention." what is limited especially as a base material used in this invention -- it is not -- needlelike or fibrous material, the shape of a scale, and the tabular matter -- the thing of various configurations, such as powdered, granular, or balun-like matter, can be mentioned. Moreover, you may be a natural mineral and may be the artificial matter. Specifically as needlelike or a fibrous material, ceramic fiber, such as an alumina fiber, titanium-dioxide fiber, and a silica fiber, etc. can be mentioned. As the shape of a scale, and tabular matter, although the mica system matter is common, flake-like matter, such as talc, etc. and an alumina flake, a titania flake, etc. may be used. powder -- as granular or balun-like matter, a titanium dioxide, silica powder, a zinc white, a barium sulfate, a kaolinite, silica balun, glass balun, a silicon bead, a glass bead, etc. are mentioned.

[0018] In invention according to claim 4, since it manufactures adjusting pH of the water dispersion which distributed the base material to 2-5, it is desirable that it is the matter insoluble to an acidic solution. Moreover, in invention and invention according to claim 4 according to claim 3, since water is

distributed and a base material is manufactured, it is desirable that it is the base material which can be distributed underwater.

[0019] The second tin compound used in this invention is a tetravalent tin compound, for example, a stannic chloride, the second tin of a sulfuric acid, the second tin of a nitric acid, etc. can be used for it. The stannous compound used in this invention is a divalent tin compound, for example, stannous chloride, stannous sulfate, the first tin of a nitric acid, etc. can be used for it.

[0020] The conductive layer of the white conductivity matter of this invention is characterized by consisting of the 1st tin oxide layer formed from the second tin compound, and the 2nd tin oxide layer formed from a stannous compound. As an amount with which the conductive layer which consists of tin oxide covers a base material, it is SnO₂ to a base material 100 weight member. It is 10 - 30 weight section that it is the 5 - 100 weight section in conversion desirable still more preferably. If the conductivity which will be discovered if there are too few amounts of covering of a conductive layer is not enough and there is conversely, it will adhere to the tin oxide for an excess, and since conductive improvement cannot be desired as compared with the amount of covering, it may become disadvantageous economically, and the bad influence to the physical properties of further others may arise. [too much]

[0021] Moreover, in invention according to claim 1, it is characterized by the antimony component not containing substantially in the 1st tin oxide layer and the 2nd tin oxide layer. As mentioned above, since the 2nd tin oxide layer which can discover high conductivity that it is easy to produce an oxygen defect in this invention is prepared, an antimony component cannot be contained but ** can also discover high conductivity.

[0022] In invention according to claim 2, the 1st tin oxide layer is formed on the front face of a base material, and the 2nd tin oxide layer is formed on the 1st tin oxide layer. More generally than that of the 2nd tin oxide layer formed from a stannous compound, the direction of the 1st tin oxide layer which forms this reason from the second tin compound is because it can cover to homogeneity more. As for the 1st tin oxide layer, from such a viewpoint, it is desirable to be formed more than 3 weight sections at least to the base material 100 weight section. The amount of covering of the 1st tin oxide layer is 5 - 20 weight section still more preferably. The 2nd tin oxide layer formed from a stannous compound introduces an oxygen defect into tin oxide, and has the work which gives higher conductivity. Since the 2nd tin oxide layer is formed from the stannous compound which is divalent tin, it serves as tetravalent tin oxide by oxidizing in the manufacture process. Therefore, it is easy to produce an oxygen defect and easy to discover higher conductivity. Although it is possible to set it as arbitration according to the physical properties which especially the amount of covering of such 2nd tin oxide layer is not limited, and are needed, it is 5 - 20 weight section that they are more than 3 weight sections at least to the base material 100 weight section desirable still more preferably.

[0023] In invention according to claim 3, a base material is first distributed in water and it considers as a water dispersion. The concentration of the base material in this water dispersion is suitably set up according to the base material to be used, and sufficient mixed stirring is possible for it, and it should just be the concentration by which the water-insoluble nature matter which carries out adhesion deposition on a base material in a back process can adhere to homogeneity.

[0024] The second tin compound is first added as the 1st step by the water dispersion of a base material. this second tin compound -- the gestalt of a solution -- it is preferably added with the gestalt of a water solution. This second tin compound is used as a hydroxide by hydrolysis into a water dispersion, for example, is made to adhere and deposit on a base material front face as water-insoluble nature matter of the second tin. At this time, a thing [making it react, an alkali solution being dropped at coincidence and keeping pH of a water dispersion like to the acid field of 2-5] according to claim 4 is desirable. Since the water-insoluble nature matter of the second tin which deposits by maintaining pH in a system at the acid field of 2-5 deposits with the gestalt which can cover a base material to homogeneity more, more uniform covering is attained. As a dropped alkali solution, a sodium hydroxide, a potassium hydroxide, a sodium carbonate, potassium carbonate, an ammonium carbonate, aqueous ammonia, etc. can be used, for example.

[0025] A stannous compound is added to a water dispersion as the 2nd step after the 1st-step above-mentioned reaction. By using as a hydroxide the stannous compound added to the water dispersion by hydrolysis, the water-insoluble nature matter of the first tin is deposited, and the adhesion deposition of the water-insoluble nature matter of this first tin is carried out on the water-insoluble nature matter of the second tin. At this time, a thing [making a stannous compound react] according to claim 4 is desirable, adding an alkali solution to addition and coincidence of a stannous compound, and keeping pH of a water dispersion like to them to the acid field of 2-5. The thing same as an alkali solution as the alkali solution added in the 1st above-mentioned step can be used.

[0026] The second tin compound is added in the 1st step, deposit covering of the water-soluble matter of the second tin is carried out, a stannous compound is added in the 2nd step, the water-insoluble nature matter of the first tin is deposited, and it is made to cover with invention given in claims 3 and 4. This is because the water-insoluble nature matter of the second tin which is tetravalent tin can cover a base material front face to homogeneity more. Moreover, there is an inclination for the direction which has pH in an acidity side to be able to cover a base material to homogeneity more. Moreover, although there is an inclination for the viscosity of the system of reaction to rise by deposit of the water-insoluble nature matter when pH of the system of reaction is made into an acidity side and the water-insoluble nature matter of the first tin is deposited from a stannous compound Since the base material is already covered with the water-insoluble nature matter of the second tin by homogeneity in the 1st step, even if it adds a stannous compound, the viscosity in a system does not rise so much, but can carry out the adhesion deposition of the water-insoluble nature matter of the first tin on the water-insoluble nature matter of the second tin at homogeneity. Therefore, according to invention given in claims 3 and 4, the water-insoluble nature matter is adhered to homogeneity, and a more uniform conductive layer can be formed.

[0027] Also at a room temperature, although the solution temperature in the case of addition of the above-mentioned second tin compound and a stannous compound is possible, it is preferably warmed at about 50-80 degrees C. By such warming, a more uniform reaction is possible.

[0028] An addition from which the 2nd tin oxide layer formed as an addition of the second tin compound and a stannous compound from the 1st tin oxide layer and stannous compound which are formed from the second tin compound serves as the desired amount of covering is chosen.

[0029] While after deposit reaction termination of the water-insoluble nature matter by addition of the above-mentioned second tin compound and a stannous compound is for a while, stirring by solution temperature as it is, it is desirable to leave it for about 0.5 to 5 hours. Formation of a thereby more firm enveloping layer can be promoted. Under the present circumstances, pH may hold pH under reaction as it is, and may raise and hold pH a little within the limits of an acid field.

[0030] Next, it dries, after filtering a water dispersion and dehydrating. A desiccation process may be performed in a series of processes with continuing heating down stream processing. The water-insoluble nature matter which carried out adhesion deposition is heat-treated on a base material after desiccation, and it considers as the tin oxide which has conductivity. Whenever [stoving temperature] is usually heat-treated at the temperature of 350-600 degrees C, although it will not be especially limited if it is the temperature which can make the enveloping layer on a base material the tin oxide which has conductivity. Moreover, although the time amount of heat-treatment changes with processing temperature etc., about 1 - 3 hours is usually preferably suitable for it for 30 minutes to 5 hours.

[0031] Since the ambient atmosphere of heat-treatment needs to oxidize and needs to make tetravalence the water-insoluble nature matter of the first tin which is divalent tin, it is performed by the oxidizing atmosphere in which oxygen was contained. Therefore, it can carry out in atmospheric air. For this reason, it is not necessary to seal like heat-treatment by the non-oxidizing atmosphere or the reducing atmosphere, and to heat-treat.

[0032] In invention according to claim 5, the white conductivity matter and binding material of this invention are mixed, and it is considering as the conductive constituent. As a binding material, the emulsion of synthetic high polymers, such as thermoplastics and thermosetting resin, natural resin and its derivative, a metal-containing organic compound, a minerals binder, an inorganic compound, or an

organic compound etc. can be used. Such binding material can be used according to the purpose and application of a conductive constituent, being able to choose. According to the operation which conductive resin constituents, such as a resin Plastic solid which needs conductivity, a coating, a film, a sheet, and ink, are mentioned as main applications, in addition is usually used, it is applicable.

[0033] although the blending ratio of coal of the white conductivity matter and binding material is not what is suitably set up according to the purpose, an application, etc. of the class of the white conductivity matter and binding material, and a conductive constituent, and is limited especially -- the binding-material 100 weight section -- receiving -- the white conductivity matter 1 - the 200 weight sections -- the range of the 5 - 100 weight section is preferably common.

[0034]

[Embodiment of the Invention] Hereafter, this invention is not limited by the following examples although a concrete example explains this invention to a detail further.

[0035] Having distributed 250g (a trade name "NT-100", Fuji Titanium Industry Co., Ltd. make) of example 1 anatase mold titanium oxide fiber in 2500ml of water, and keeping water temperature at 70 degrees C, with the agitator, it stirred for 10 minutes and slurred. Next, what mixed 66.6g of 12% of the weight of hydrochloric acids with 130g (23 % of the weight of Sn conversions) of water solutions of a stannic chloride was dropped over about 1 hour into this slurry, and 15% of the weight of the sodium-hydroxide water solution was separately dropped at it and coincidence into the slurry, and it adjusted so that pH of the whole slurry might become within the limits of 3-4. After this 1st-step dropping reaction was completed, it stirred for 30 minutes, maintaining pH as it is and solution temperature.

[0036] Next, the solution which added 100g of 12% of the weight of hydrochloric acids was dropped at 130g (23 % of the weight of Sn conversions) of water solutions of stannous chloride over about 1 hour, and like the time of the 1st-step [above-mentioned] addition, 15% of the weight of the sodium-hydroxide water solution was separately dropped at the slurry at coincidence, and pH was adjusted so that it might become within the limits of 3-4. After this 2nd-step dropping reaction was completed, it stirred for 30 minutes, maintaining pH as it is and solution temperature. Then, it dried, after having filtered the resultant, rinsing and dehydrating after radiationnal cooling to a room temperature. In the atmospheric air which is an oxidizing atmosphere, the obtained desiccation article was heat-treated at 400 degrees C for 1 hour, and the white conductivity matter was obtained.

[0037] Except changing the fiber used as example 2 base material into rutile type titanium dioxide fiber (a trade name "FTL-200", Ishihara Sangyo Kaisha, Ltd. make), it presupposed that it is the same as that of an example 1, and the white conductivity matter was obtained.

[0038] The white conductivity matter was obtained like the example 1 except changing example 3 base material into the spherical powder (trade name "Nipsil L-300" Japan silica industrial company make, mean particle diameter of 7 micrometers) of oxidation silicon.

[0039] It slurred having distributed 250g of this anatase mold fiber in 2500ml of water, and keeping at 70 degrees C using the same anatase mold fiber as example of comparison 1 example 1. Next, what mixed 66.6g of 12% of the weight of hydrochloric acids with 260g (23 % of the weight of Sn conversions) of water solutions of stannous chloride was dropped over about 1 hour into this slurry, 15% of the weight of the sodium-hydroxide water solution was separately dropped at it and coincidence, and pH was maintained at the range of 3-4. After that, dehydration, desiccation, and heat-treatment were performed like the example 1, and the white conductivity matter was obtained.

[0040] The white conductivity matter was obtained by the same approach as the example 1 of a comparison except changing into a stannic chloride the tin raw material added example of comparison 2.

[0041] The white conductivity matter was obtained by the same approach as the example 2 of a comparison except changing into the rutile type titanium dioxide fiber which used the fiber used as example of comparison 3 base material in the example 2.

[0042] As a tin raw material added example of comparison 4, the white conductivity matter was obtained by the same approach as an example 2 the 1st step and except using the 2nd step of stannous chloride both.

[0043] In the example 4 of example of comparison 5 comparison, the amount of 15% of the weight of the sodium-hydroxide water solution dropped for pH adjustment was applied a little superfluously, and the white conductivity matter was obtained like the example 4 of a comparison except making pH under reaction react as an alkaline field of the range of 10-11.

[0044] In example of comparison 6 example 1, the white conductivity matter was obtained like the example 1 except adding the solution made to dissolve 12.8g of antimony trichlorides in 66.6g of hydrochloric acids 12% of the weight, and being dropped as a mixed solution into the stannic chloride solution dropped in the 1st step.

[0045] the example 7 of a comparison -- the solution dropped in the 1st step was used as the solution which contained antimony like the example 6 of a comparison, and the white conductivity matter was obtained like the example 5 of a comparison except applying the amount of a sodium-hydroxide water solution a little superfluously like the example 5 of a comparison, and performing a reaction in an alkaline field.

[0046] The tin raw material of the base material matter in the above-mentioned examples 1-3 and the examples 1-7 of a comparison, the 1st step, and the 2nd step, pH at the time of tin raw material addition, and the existence of the stibiation are collectively shown in Table 1. Moreover, the volume resistivity (ohm-cm) of fine particles was measured about the obtained white conductivity matter. In addition, measured value is 100kg/cm². It is the value measured under the load.

[0047] Furthermore, the degree of hunter white of fine particles was measured about the obtained white conductivity matter. Measurement is 1 t/cm² to fine particles. A green compact (the diameter of 40mm, thickness of 2mm) is created putting a pressure, and it is JIS. L value (lightness index) specified to Z-8722-8730 was measured, and it considered as the degree of hunter white.

[0048] The volume resistivity and the degree of hunter white of fine particles of each above-mentioned example and each example of a comparison are shown in Table 1.

[0049]

[Table 1]

	基 材 物 質			第1段階の錫原料		第2段階の錫原料		pH		アンチモン 添加の有無		粉 体 の 体 積 抵 抗 率 ($\Omega \cdot \text{cm}$)	粉 体 の ハンター 白 度
	アナター ゼ 繊 維	ル チ ル 繊 維	SiO ₂ 粉 末	SnCl ₂	SnCl ₄	SnCl ₂	SnCl ₄	酸 性	アルカ リ 性	第1 段階	第2 段階		
実施例1	○				○	○		○		無	無	4.0×10^2	89
実施例2		○			○	○		○		無	無	4.0×10^2	88
実施例3			○		○	○		○		無	無	8.0×10^2	90
比較例1	○			○				○		無	無	7.0×10^5	88
比較例2	○				○			○		無	無	2.0×10^5	87
比較例3		○			○			○		無	無	1.0×10^5	86
比較例4		○		○		○		○		無	無	1.0×10^7	88
比較例5		○		○		○			○	無	無	8.0×10^6	87
比較例6	○				○	○		○		有	無	1.0×10^1	75
比較例7		○		○		○			○	有	無	3.0×10^2	78

[0050] The white conductivity matter of the examples 1-3 according to this invention has a low volume resistivity, and it turns out that it has the outstanding conductivity so that clearly from Table 1.

Moreover, the degree of hunter white is high and it turns out that it has a high whiteness degree.

Moreover, although the example 6 of a comparison and the example 7 of a comparison which made antimony contain have high conductivity, the degree of hunter white is low, and it turns out that it is inferior in a whiteness degree.

[0051] Next, it kneaded with the various resin which shows the white conductivity matter of each above-mentioned example and each example of a comparison in Table 2, and the conductive resin constituent was produced. To the resin 100 weight section, the blending ratio of coal carried out kneading combination so that it might become the white conductivity matter 40 weight section. As resin, urethane resin (a trade name "V top", Dai Nippon Toryo Co., Ltd. make), acrylic resin (a trade name "a bitter taste rose supermarket", Dai Nippon Toryo Co., Ltd. make), and phenol resin (trade name "FENO light" Dainippon Ink chemistry company make) were used.

[0052] The obtained resin constituent was fabricated in the shape of a sheet, and the surface resistivity was measured. As a sample, the sheet of an one-side square (10cm and thickness 2mm) is created, and it is JIS. Based on K-6911 law, it computed based on the degree type.

[0053]

[Equation 1]

$$\text{表面抵抗率}(\Omega) = \frac{\pi(D+d)}{D-d} \times R_s$$

[0054] Here, in the bore (cm) of a surface annular electrode, and d, the outer diameter (cm) of the inner circle of a surface electrode and R_s express measurement resistance (ohm), and π expresses [D] a circular constant (*3.14). The surface resistivity (ohm) measured as mentioned above is shown in Table 2.

[0055]

[Table 2]

	ウレタン樹脂	アクリル樹脂	フェノール樹脂
実施例 1	4.0×10^6	5.0×10^6	7.0×10^6
実施例 2	2.0×10^6	3.0×10^6	6.0×10^6
実施例 3	9.0×10^6	9.7×10^6	1.0×10^7
比較例 1	10^{12} 以上	10^{12} 以上	10^{12} 以上
比較例 2	4.0×10^{10}	4.5×10^{10}	7.0×10^{10}
比較例 3	2.0×10^{10}	3.0×10^{10}	5.0×10^{10}
比較例 4	10^{12} 以上	10^{12} 以上	10^{12} 以上
比較例 5	10^{12} 以上	10^{12} 以上	10^{12} 以上
比較例 6	5.0×10^4	6.0×10^4	1.0×10^5
比較例 7	3.0×10^6	4.0×10^6	6.0×10^6

[0056] It turns out that each resin constituent which blended the white conductivity matter of the examples 1-3 according to this invention shows the outstanding conductivity so that clearly from Table 2.

[0057]

[Effect of the Invention] The white conductivity matter of this invention has the high whiteness degree which is the white conductivity matter with which antimony is not contained but ** can also demonstrate high conductivity.

[0058] According to the manufacture approach of this invention, the white conductivity matter of this invention can be manufactured efficiently. Since the conductive constituent of this invention contains the white conductivity matter of above-mentioned this invention, it excels in conductivity and it can be used as the conductive high constituent of a whiteness degree.

[Translation done.]